having poles set alternately all round a circular frame. Figs. 4 and 5 show how this is carried out. A cast-iron ring having projecting iron pieces screwed into it is surrounded by zig-zag conductors which carry into it the current from a separate exciter. These currents pass up and down between the projecting cheeks, and excite those on both sides of them.

A still more recent, and still larger generator, is that designed by Mr. J. E. H. Gordon, whose "Physical Treatise on Electricity and Magnetism" is known to most of our readers. This machine, which is given in elevation in Fig. 6, and in end-elevation in Fig. 7, is more than 9 feet in height, and weighs 18 tons. It possesses several points of interest. The rotating armature differs from those of the well-known Gramme or Siemens' armatures, being in form a *disc*, constructed of boiler-plate, upon which the coils are carried. The machine, therefore, resembles in some respects the Siemens' alternate-current machine, though there are notable points of difference, the most important being, that whereas in most dynamo-machines the inducing field-magnets are fixed, and the induced coils rotating, in Mr. Gordon's new machine the rotating coils are those which act inductively upon the fixed coils between which they revolve. The machine furnishes alternate currents, and therefore requires separate exciters. These exciters, two Bürgin machines, send currents which enter and leave the revolving armature by brushes pressing upon rings of phosphor bronze placed upon the axis at either side. There are 64 coils upon the rotating disc, and double that number upon the fixed framework. These 128 "taking-off" coils, the form of which is shown in Fig. 8, are alternately connected to two circuits, there being 32 groups in parallel arc, each parallel containing 4 coils in series; thus bringing the total electromotive force to 105 volts when the machine is driven at 140 revolutions per minute. At this speed it actuates 1300 Swan lamps, but is calculated to actuate from 5000 to 7000 if the driving power is proportionately increased. The machine is now in operation at the Telegraph Construction and Maintenance Company's Works, East Greenwich.

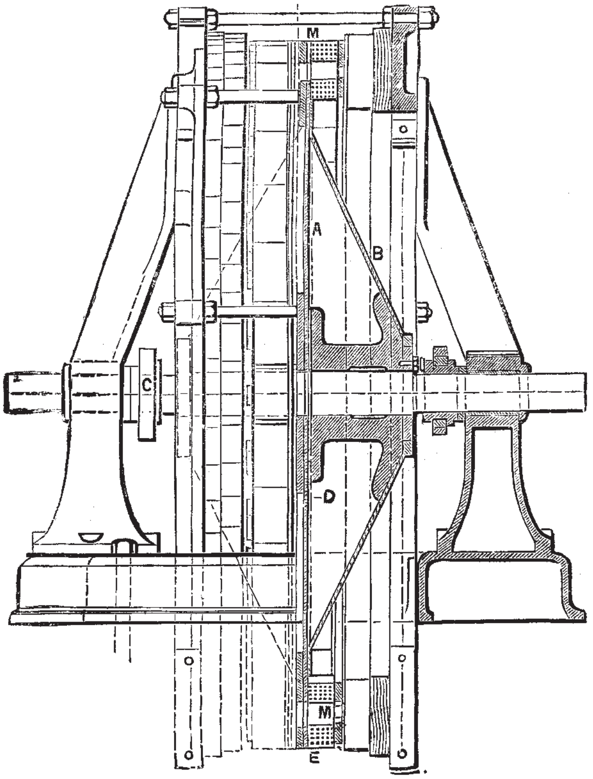

FIG. 7.—End Elevation and Section of Gordon's Dynamo.

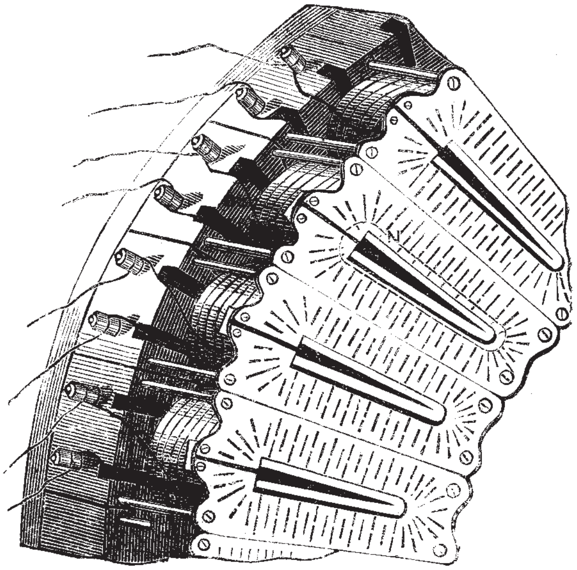

FIG. 8.—The Fixed Coils of Gordon's Dynamo.

A great deal has been said in certain quarters of late about another new dynamo, the invention of Mr. Ferranti, which, with one of those unscientific exaggerations which cannot be too strongly condemned, was pronounced to have an efficiency five times as great as that of existing dynamos. The construction of this machine has not yet been made known, but it is understood that it has no iron in the rotating armature. This is, however, no novelty in dynamos. It appears, also, that Mr. Ferranti has invented an alternate-current machine almost identical with that of Sir William Thomson described above.

Lastly, M. Gravier claims to have designed a form of dynamo in which there are neither commutators nor separate exciters, but in which continuous currents of electricity are produced in stationary coils by the passage near them of a rotating series of iron bars whose magnetism is changed, during their passage, by the reaction of the cores of the stationary coils themselves. M. Gravier has also designed a machine in which a Gramme-ring is wound with two sets of coils, a primary and a secondary, each set having its own commutator on opposite ends of the axis. A current from a separate exciting machine passes into the primary coils of the ring by one pair of brushes, and the secondary current is taken off by a second pair of brushes at the other commutator placed at right angles to the first pair. We are not aware that any practical machine thus constructed has yet been shown in action.

It is certain that there is yet abundant room for great improvement in the construction of dynamo-electric machines. But the inducements to improvement at the present time are so great that rapid progress toward the desired goal of perfect efficiency and simplicity of structure is more than assured.

THE PROJECTION PRAXINOSCOPE

M. GASTON TISSANDIER describes in *La Nature* an ingenious adaptation of the praxinoscope, under the above name, by means of which the images are projected on a screen, and are visible to a large assembly.

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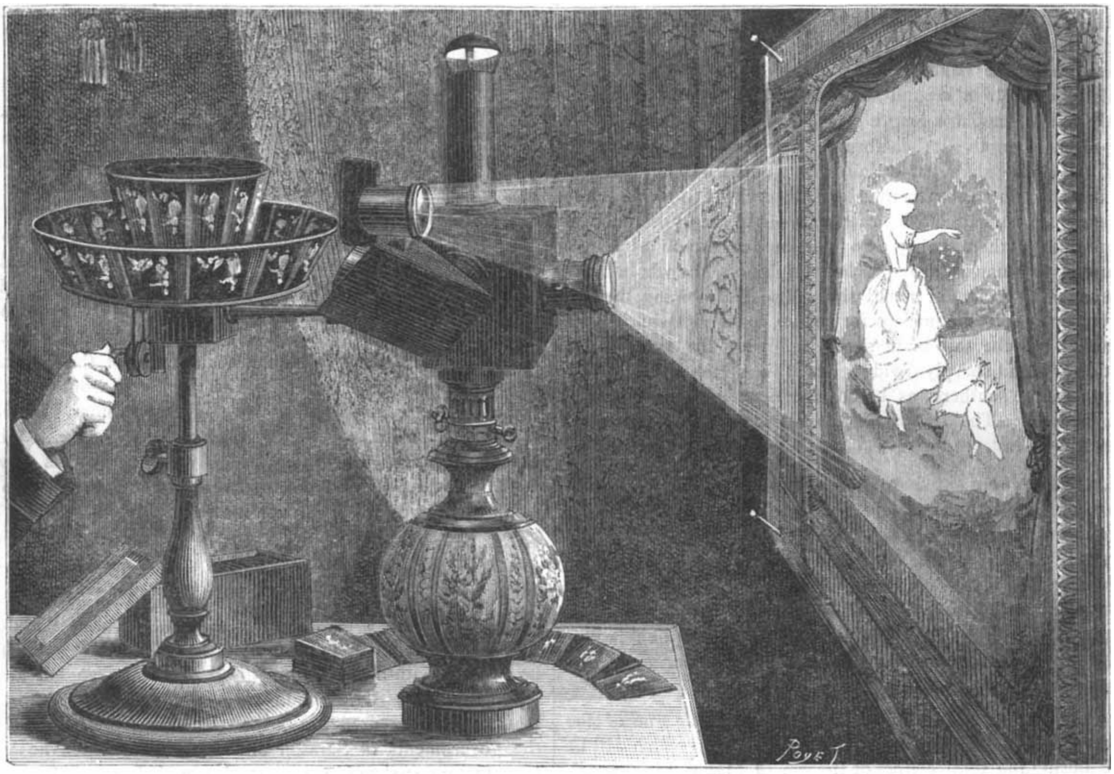
Our engraving will give an idea of the arrangement and the effect produced. By a modification of the "lampascope," M. Reynaud, the inventor, obtains by means of an ordinary lamp, at once the projection of the scene or background—by the object-glass which is seen at the side of the lantern—and of the subject, by another object-glass which is shown in front of and a little above the same lantern. For this, the positions or phases which form a subject are drawn and coloured on glass, and are connected in a continuous band by means of any suitable material. One of these flexible bands is placed in the wide crown of the praxinoscope, which is pierced with openings corresponding to the phases of the subject. To understand the course of the luminous rays which go to form the image, it is necessary to bear in mind the condensing lens which, placed near the flame of the lamp, is not visible in the figure; then a plane mirror inclined 45°, which reflects the rays and causes them to traverse the figures filling the openings of the crown. These rays, reflected once more by the facets of the prism of mirrors, finally enter the object-glass, which transforms the vertical central image into a real image magnified on the screen. In making the two parts of the apparatus converge slightly, the animated subject is brought into the middle of the background, where it then appears to gambol. A hand-lever on the foot of the instrument allows a moderate and regular rotation to be communicated. This apparatus, with an ordinary moderator lamp, supplies well-lighted pictures and curious effects. It enables us to obtain, with the greatest ease, animated projections, without requiring any special source of light, by simply utilising the lamp in daily use.



M. Reynaud's new projection-praxinoscope.

NOTES

We take the following from the *Times*:—The council of the Royal Society have awarded the medals in their gift for the present year as follows: The Copley Medal to Prof. Cayley, F.R.S., for his researches in pure mathematics; the Rumford Medal to Capt. Abney, F.R.S., for his photographic researches and his discovery of the method of photographing the less refrangible part of the spectrum, especially the infra-red region; a royal medal to Prof. W. H. Flower, F.R.S., for his contributions to the morphology and classification of the mammalia and to anthropology; and a royal medal to Lord Rayleigh, F.R.S., for his papers in mathematical and experimental physics; the Davy Medal (in duplicate) to D. Mendelejeff and Lothar Meyer for their discovery of the periodic relations of the atomic weights. These medals will be presented at the anniversary meeting of the society on St. Andrew's Day.

The President and Council of the Geological Society hold a *conversazione* in the Society's rooms on Wednesday, the 29th inst. Fellows of the Society who have objects of interest suitable for exhibition are asked kindly to lend them for the occasion.

It is announced that General Pitt Rivers will be appointed Inspector of Ancient Monuments under the recent Act.

We announced last week the death, at the age of sixty-six years, of Prof. Johannes Theodor Reinhardt, Inspector of the Zoological Museum of the University of Copenhagen. Prof. Reinhardt was a well-known zoologist, author of an excellent memoir on the Birds of the Campos of Brazil, and of numerous papers in the scientific periodicals of Copenhagen, and will be regretted by many friends and correspondents in this country.

At the sitting of the Paris Academy of Sciences on November 13, M. Faye read letters from the captain of the *Niger*, French

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